2:15 p.m.

868-2 **Catheter Ablation of Chronic Atrial Fibrillation Guided by Noncontact Mapping: Are Continuous Linear Lesions Associated With Ablation Success?**

Karlheinz Seidl, Monika Rameken, Margit Vater, Harald Schwacke, Andreas Brandt, Jochen Senges, *Heart Center, Ludwigshafen, Germany.*

A catheter-based, left atrial (LA) ablation procedure was performed using non-contact-mapping (NCM) in 14 patients (pts) with chronic atrial fibrillation (CAF). The LA lesion geometry used has been shown to be effective in pts with CAF, in whom intraoperative RF-catheter ablation was performed to eliminate anatomically defined "anchor" reentrant circuits. Aim of this study was 1) to translate a successfull surgical LA intervention into a catheter procedure, 2) to evaluate the usefulness of NCM to identify and close discontinuities in linear lesions, 3) to assess the impact of linear lesion continuity on ablation success of CAF. Methods: LA-ablation was performed with four linear lesions between the mitral annulus and the left inferior pulmonary vein (PV), to the left upper PV, then to the right upper PV, and finally to the right lower PV in 14 pts with CAF. During online analysis, NCM revealed conduction across gaps in the linear lesions in all pts (overall 58 gaps were found with a mean of 4.5 ± 0.9 gaps/pts). In addition contact mapping was performed. With contact mapping a discontinuity of linear lesion was identified by a localized loss of double potentials in 27 of the 58 gaps (47%). In the remaining 31 gaps (53%) interpretation of contact mapping was difficult because of the diminished amplitude of local electrograms. Catheter ablation was guided by NCM until complete conduction block was observed. During follow-up of 12 ± 7 months, 6/14 pts (43%) remained in sinus rhythm without antiarrhythmic drugs (in 5 of the 6 pts no gap was identified during offline analysis) and an additional 4 pts were maintained in sinus rhythm with antiarrhythmic drugs (in all 4 pts 1 gap was identified during offline analysis), resulting in an overall success rate of 71 % (10/14 pts). Conclusions: The intraoperative radiofrequency ablation strategy could be translated into a catheter based procedure using NCM. The overall success rate was 43% without and 71% with additional antiarrhythmic drugs. All pts without gaps during offline analysis were free of recurrence. All pts with a recurrence of CAF had more than 1 gaps identified after the inital ablation procedure. Successful ablation of CAF is associated with continuity of linear lesions.

2:30 p.m.

868-3 **Remote Control of a Magnetic Electrophysiology Catheter Allows Precise Intracardiac Navigation and Eliminates Radiation Exposure to the Operator**

Mitchell N. Faddis, Kyongtae T. Bae, Michael Talcott, Andrew Hall, Jennifer Dehne, John Rauch, Bruce D. Lindsay, Scott Klimek, *Washington University School of Medicine, St. Louis, Missouri, Stereotaxis, Inc., St. Louis, Missouri.*

BACKGROUND: We have previously reported intracardiac navigation of a magnetic catheter (MC) by computer controlled magnetic field vectors. The purpose of this study in canines was to determine whether the Magnetic Navigation System (MNS) in combination with a catheter advancer system (CAS) would enable the operator to control all catheter movements from a remote work station. METHODS: The MNS is composed of biplanar fluoroscopy, a computer to control the system, an array of superconducting electromagnets that surround the subject's torso, and a computer graphics work station. The CAS consists of a variable speed rotary motor connected by a flexible drive shaft to two spring-loaded wheels that advance or retract the catheter when the wheels rotate. The rate and forward/reverse direction of the CAS are controlled by a joystick. A static 3D image of the cardiac blood pool was constructed and transferred to a fluoroscopic monitor adjacent to a conventional fluoroscopic image. The 3D-CT image provided an anatomic reference for intracardiac mapping to supplement the biplanar fluoroscopic image during cardiac mapping. RESULTS: The MC was advanced through the inferior vena cava to the right atrium by the CAS. The MNS directed the catheter to selected targets in the right atrium, tricuspid annulus, and right ventricle. The MC was positioned on the tricuspid annulus and a series of radiofrequency energy applications created a linear lesion as the CAS retracted the catheter back to the IVC. Next, the MC was inserted into the femoral artery, and the MNS/CAS were used for remote retrograde guidance of the MC to all 6 pulmonary veins in each animal. Post-mortem examination showed no evidence of perforation or injury related to catheter navigation. CONCLUSIONS: These results demonstrate the feasibility of precise, remote control of the MC by the MNS/CAS that completely eliminates radiation exposure to the operator.

2:45 p.m.

868-4 **Differences in Voltage and Timing of Local Activation Between Unipolar and Bipolar Electrograms During Supraventricular Tachycardia May Affect the Outcome of Catheter Ablation Procedures**

Natasia M S. de Groot, Martin J. Schalij, *Leiden University Medical Center, Leiden, The Netherlands.*

Target sites for RFCA are identified by endocardial mapping of the activation sequence and potential distribution using either unipolar or bipolar electrograms.The aim of this was to analyse differences between unipolar and bipolar electrograms using an electroanatomical mapping system (CARTO™).
Methods: Patients (n=44, 16 M, age 59±12 yr.) referred for ablation of atrial flutter (AFL, n=17), focal atrial tachycardia (FAT, n=4), atrio-ventricular nodal reentrant tachycardia (AVNRT, n=5) or intra-atrial reentrant tachycardia (IART, n=18) were studied. Activation maps were constructed by marking the maximum negative slope of the intrinsic deflection and the maximum amplitude of respectively unipolar and bipolar electrograms. Voltage maps were constructed by measuring the peak-to-peak amplitude of the recorded signals. Results: Electrograms recorded during tachycardia (AFL: n=2328, IART: n=4862, FAT: n=492, AVNRT: n=364), and sinus rhythm (AFL: n=300, AVNRT: n=550) were analysed. Voltages of unipolar electrograms were significantly larger than voltages of bipolar electrograms ($p<0.001$). This resulted in an overestimation of areas of scar tissue especially in IART pts when using bipolar signals only. The local activation time of unipolar electrograms was correlated with the local activation time of bipolar electrograms in patients with FAT, AVNRT and AFL ($r=0.4$, $p<0.001$) but not in the IART group($r=0.14$, $p=0.2$). In the IART pts more fragmented electrograms were recorded than in the other pts ($p<0.05$). In case of fragmented electrograms, disparity of local activation time between unipolar and bipolar electrograms is more present in areas with fragmented electrograms. Conclusion: Bipolar voltage mapping results in overestimating areas of scar tissue and may result in "blanking" of areas of slow conduction. Therefore, additional activation mapping should be used to localize crucial pathways of slow conduction.

3:00 p.m.

868-5 **Elimination of Pulmonary Vein Potentials for Catheter Ablation of Focal Atrial Fibrillation Guided by Noncontact Mapping: Comparison of Two Different Approaches**

Karlheinz Seidl, Monika Rameken, Margit Vater, Harald Schwacke, Andreas Brandt, Jochen Senges, *Heart Center, Ludwigshafen, Germany.*

Primary catheter ablation of triggering foci of atrial fibrillation (AF), often located in or near the pulmonary veins (PV) is often hampered by the inappearence of the trigger during the ablation procedure. Non-contact-mapping (NCM) permits high density mapping of transient arrhythmias. Aim of the study was 1) to evaluate the number and location of foci identified by NCM, 2) to assess how often the identified focus triggers the onset of AF during the procedure, 3) to investigate the ablation success of two different approaches for ablating the triggers. Methods: In 25 pts with symptomatic drug refractory AF a left atrial ablation procedure was performed. The anatomy of the left atrium was reconstructed using the NCM after a dual transseptal approach. NCM was performed to identify triggering foci. In the first 12 pts the target site for ablation were foci identified by NCM. In the following 13 pts radiofrequency ablation was deployed at the PV-LA junction to selectively interrupt muscle fibers entering the PV. In these 13 pts the PV ostia were entered by a spiral multipolar catheter and the location of these catheter was labeled at the 3-D geometry of the LA. After at least 3 PV were labeled at the 3-D geometry the spiral catheter was removed and a conventional ablation catheter was navigated to the target site for interrupting the PV entry. Results: Overall 38 foci were identified (12 LSPV, 7 LIPV, 5 RSPV, 2 RIPV, 12 LA). 12 (32%) of the 38 foci were located outside of the PV.In 5/25 pts (20%) AF oneset was recorded by NCM.During a mean follow up of 5±3 months 6 (50%) of 12 pts with ablating the triggers were free of recurrence, in contrast to 9 of 13 pts (69%), who were free of recurrence with interruption of the muscle fibers entering the PV. In 8 of the 10 pts with an focus outside of the PV AF recurred. Complications: hemopericard in 1 pt, and a AV fistula in 1 pt. Conclusion: 1) About 1/3 of triggering foci were located outside the PV. 2) In pts with extra PV foci the success rate is low (20%). 3) Targeting only the foci the success rate is 50 %. 4) Trigger elimination by selectively interruption of the muscle fibers entering the PV is most effective with clinical success of 70 % during a short follow up of 5 months.

3:15 p.m.

868-6 **A Randomized Comparison of Unipolar Versus Bipolar Recordings as a Guide for Segmental Pulmonary Vein Isolation**

Hiroshi Tada, Hakan Oral, Mehmet Ozaydin, Aman Chugh, Christoph Scharf, Sohail Hassan, Radmira Greenstein, Frank Pelosi, Jr., Bradley P. Knight, S. Adam Strickberger, Fred Morady, *Gunma Prefectural Cardiovascular Center, Maebashi, Japan, University of Michigan, Ann Arbor, Michigan.*

Background: Unipolar electrograms (Uni Egms) recorded near the ostia of the pulmonary veins (PVs) may provide better discrimination between successful and unsuccessful radiofrequency (RF) ablation sites than bipolar Egms. It also may provide an accurate method for localization of the ablation catheter relative to the electrodes of a Lasso catheter. The purpose of this study was to determine whether the use of Uni Egms facilitates segmental isolation of PV's.
Methods: Segmental isolation of the left superior (LS), right superior (RS), and left inferior (LI) PV's was attempted in each of the 31 patients (25 men, 54±13 yrs) with paroxysmal atrial fibrillation. In each PV, target sites for ablation were determined, on a random basis, by analysis either of only bipolar recordings (Bi-group), or of both unipolar and bipolar recordings (Uni-group). Target sites for ablation were selected by identifying PV potentials that had equivalent or earlier activation relative to adjacent Lasso catheter recording sites. In the Uni-group, ablation was performed at sites where the morphology of the Uni Egm recorded by the ablation catheter matched the morphology of the Uni Egm recorded by the electrode of the Lasso catheter that had the earliest activation and the steepest intrinsic deflection.
Results:

Group	Procedure Time (min)	RF Number	RF duration (min)	Fluoroscopy Time (min)
Bi n=41 (LS 14;RS 14;LI 13)	39.8±19.7	14.0±7.5	8.0±4.2	16.2±9.9
Uni n=45 (LS 15;RS 16;LI 14)	30.5±15.9	10.0±5.6	5.9±3.2	13.1±8.4
P value	<0.05	<0.01	<0.01	0.12